Structural Analysis III

Q. 1 Derive elemental stiffness matrix for plane truss element.
Q. 2 Derive rotation transformation matrix for plane truss element giving relationship between member/local and structure/global axes.
Q. 3 Write the step by step procedure to obtain structural matrix for a plane truss element.
Q. 4 Analyse the plane truss shown in fig. 1

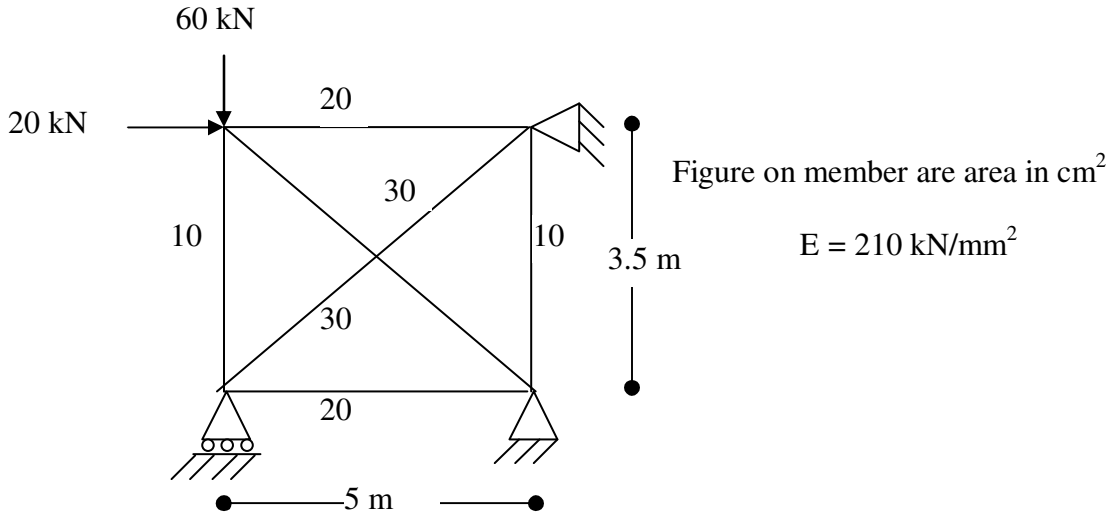


Fig. 1

Q. 5 Evaluate global stiffness matrix for plane truss shown in fig. 2

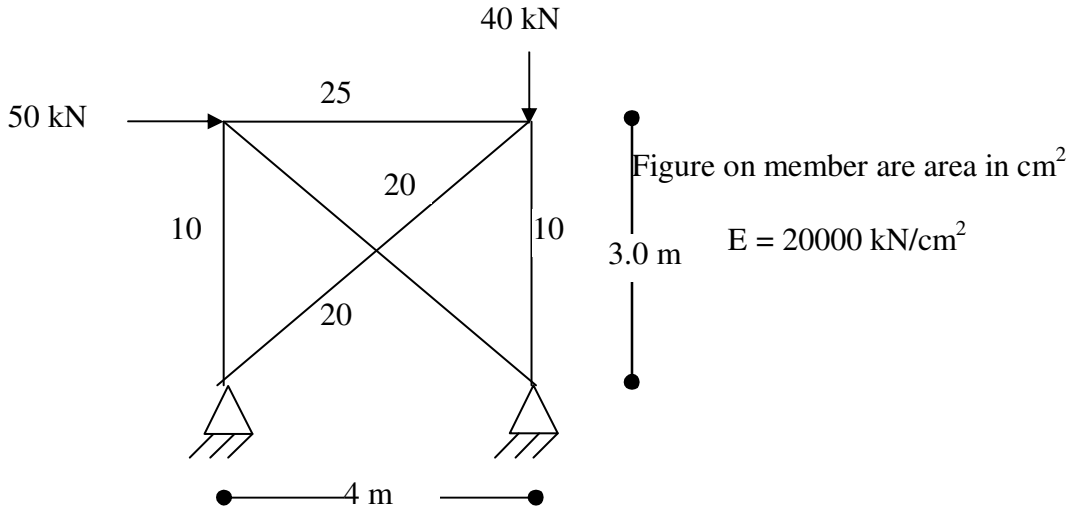


Fig. 2

Q. 6 Analyse by stiffness method and find member forces for plane truss shown in fig. 3

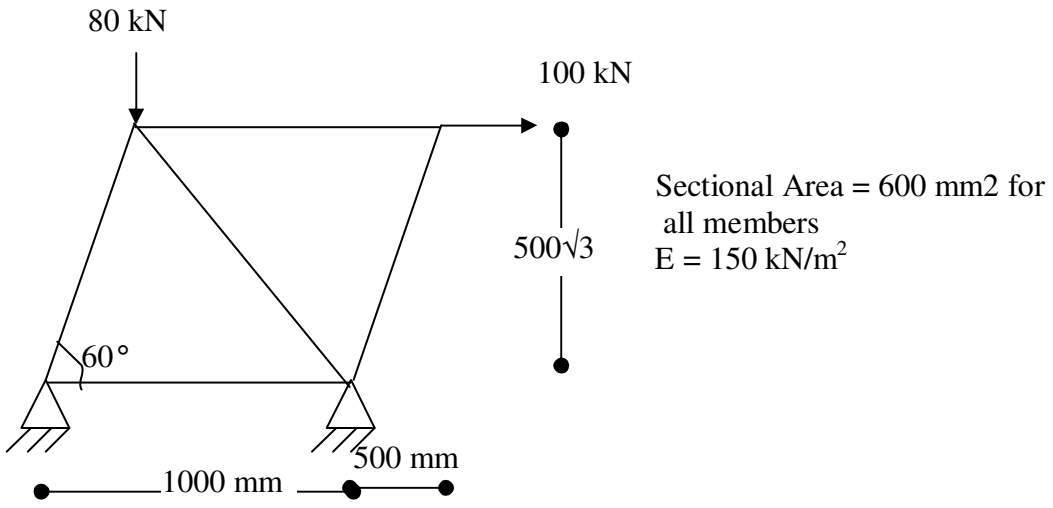
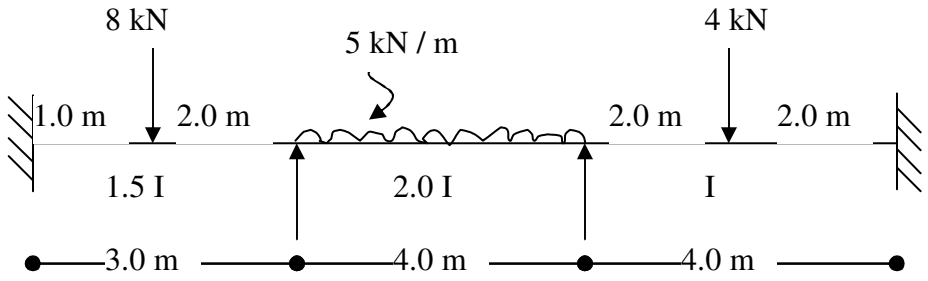


Fig. 3

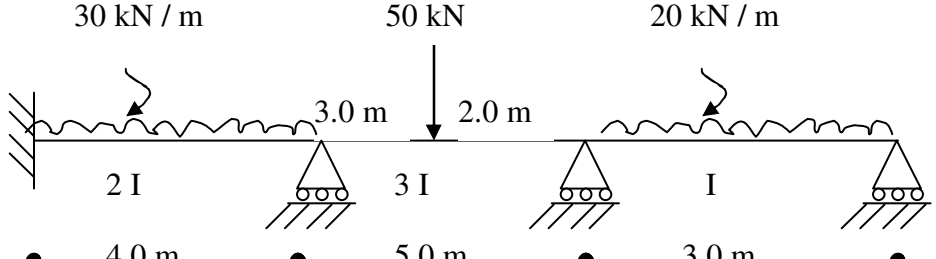
Q. 7 Derive elemental stiffness matrix for 1D beam element.
Q. 8 Derive elemental stiffness matrix for 2D beam element.
Q. 9 Derive rotation transformation matrix for 2D beam element giving relationship between member/local and structure/global axes.

Q. 10 Write the step by step procedure to obtain structural matrix & structural load vector for a 2D beam element.

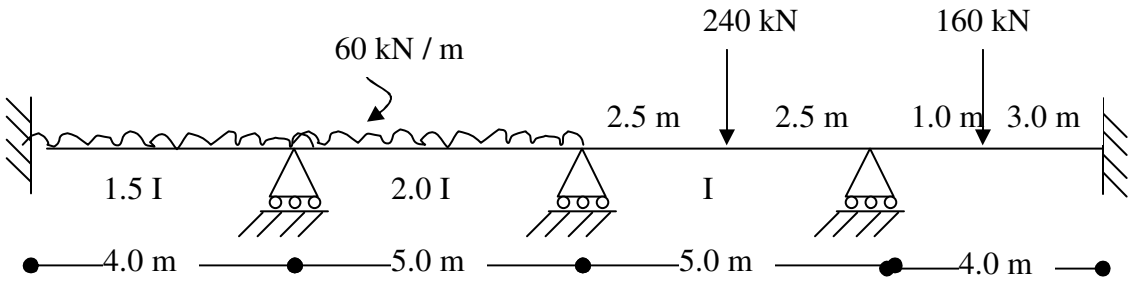
Q. 11 Analyse the continuous beam shown in fig. 4. Take EI = 1 Units



Q. 12 Analyse the continuous beam shown in fig. Take EI = 1 Units



Q. 13 Analyse the continuous beam shown in fig. Take EI = 1 Units

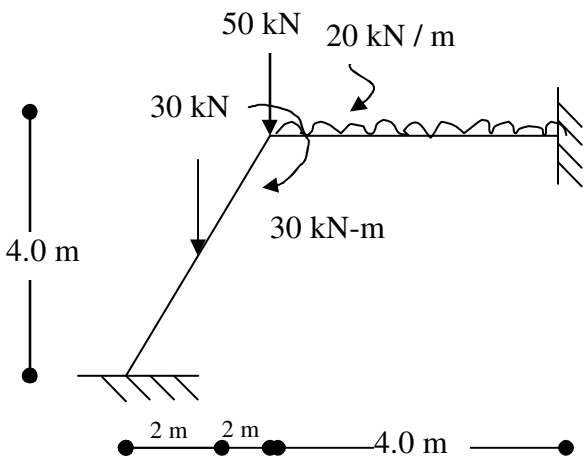


Q. 14 Derive elemental stiffness matrix for plane frame element.
Q. 15 Derive rotation transformation matrix for plane frame element giving relationship between member/local and structure/global axes.

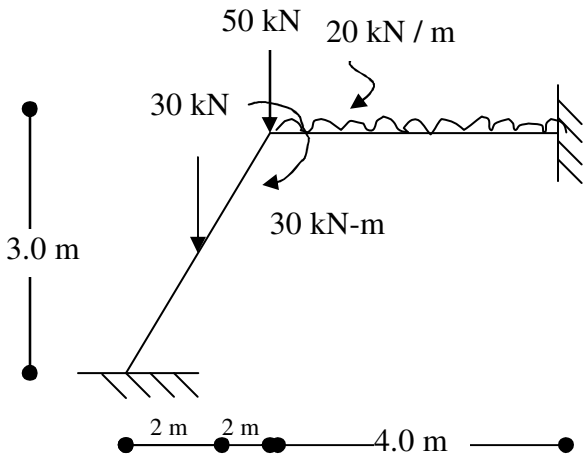
Q. 16 Write the step by step procedure to obtain structural matrix & structural load vector for a plane frame element.

Q. 17 Analyze the plane frame shown in fig. 3 Take E= 25.5×10^6 kN/m^2

B = 30 cm
D = 50 cm

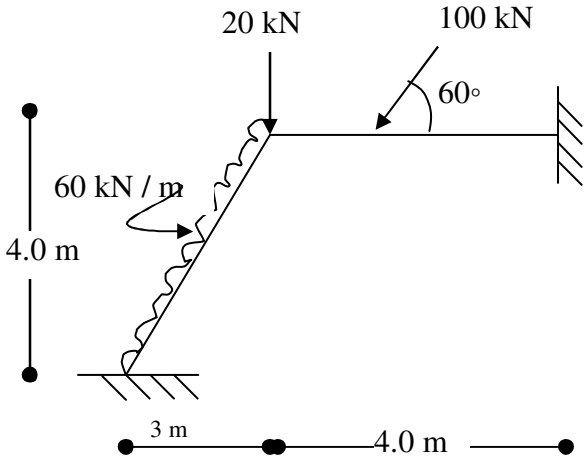


Q. 18 Analyze the plane frame shown in fig. Take E= 25.5×10^6 kN/m^2



B = 30 cm
D = 50 cm

Q. 19 Analyze the plane frame shown in fig. Take E= 1.5×10^7 kN/m^2

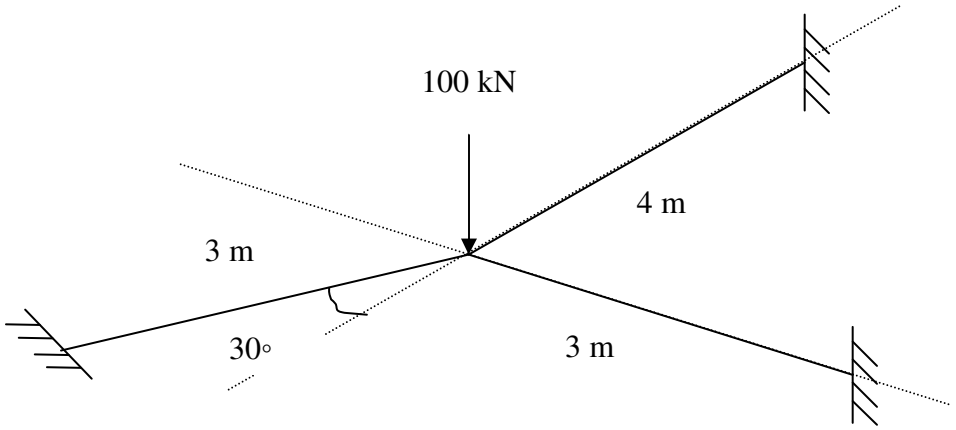


A = 0.06 m^2
I = 45×10^{-5} m^4

Q. 20 Derive elemental stiffness matrix for plane grid element.
Q. 21 Derive rotation transformation matrix for plane grid element giving relationship between member/local and structure/global axes.

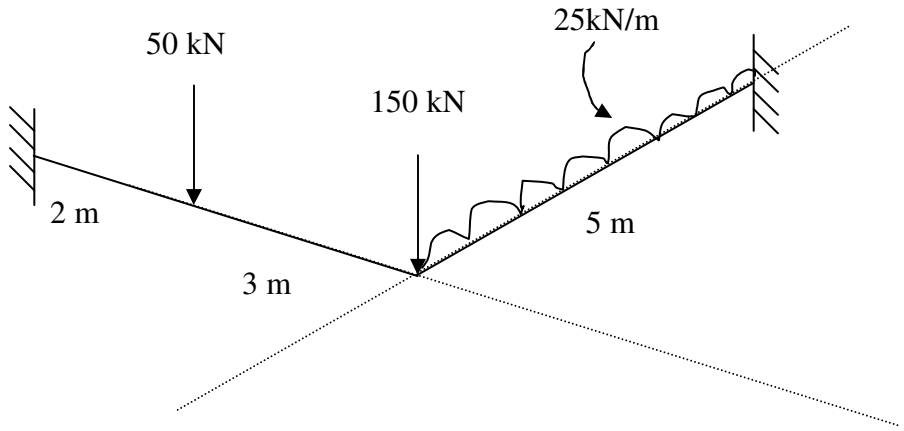
Q. 22 Write the step by step procedure to obtain structural matrix & structural load vector for a plane grid element.

Q. 23 Determine free joint displacement of plane grid shown in fig. c/s of all the members are, 300mm x 500 mm, e = 25.5 kN/mm2,G = 10.62 kN/mm2 , Ixx = $db^3/3$



Q. 24 Analyze the plane grid shown in fig. Take E= $22x10^6$ kN/m^2 ,

G= $8.8x10^6$ kN/m^2 , b = 300 mm , d = 500 mm, J =Ix = $db^3/3$



Q. 25 Analyze the plane truss shown in fig. Take E= 22×10^6 kN/m^2 , A = 1000 mm2 for all members

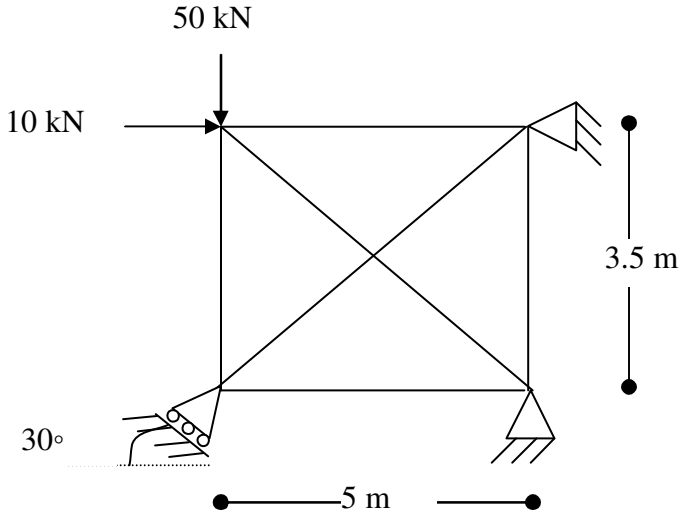


Fig. 1

Q. 26. Assemble global stiffness matrix for the plane truss , if the member AB is too short by 5 mm (lack of fit) . Take E= 22×10^6 kN/m^2 , A = 1000 mm2 for all members

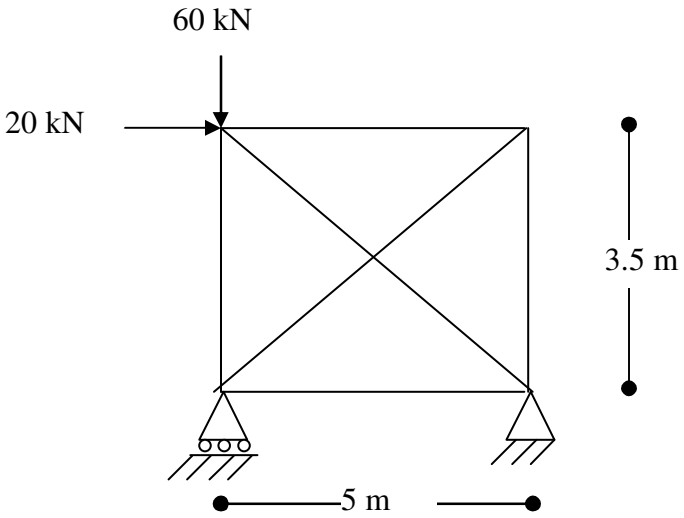


Fig. 1

Q.27 a plane truss shown in fig. find the nodal displacement using stiffness method considering following conditions

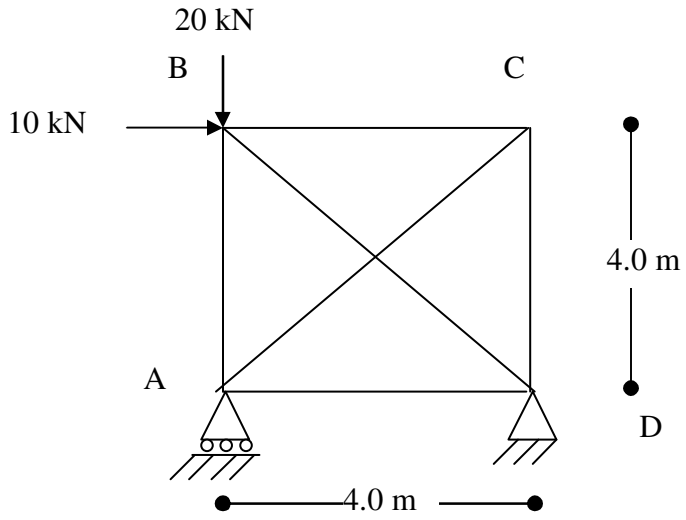
i) Temperature rise of 30 degree

ii) member BD is longer by 0.02 mm

Area of C/s = 20 mm2

E= 2.0×10^5 N/mm^2

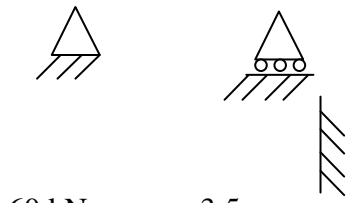
α= 12 x 10 -6 /◦C



Q.28 Explain semi band width and band minimization with suitable example.

Q.29 Derive stiffness matrix and load matrix for beam element subjected to udl on entire span by finite element method .

Q.3 Using fundamental of finite element method derive elemental load vector for a 2 nodded beam element subjected to point load and couple at centre of element.


60 kN
3.5 m